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[54] Title of invention: Portable rivet gun

[57] Abstract

A portable rivet gun using an electric motor, which can be used in a wide range of places, not requiring a special sealed structure, with a speed that can easily be adjusted during riveting and having a low manufacturing cost. It makes use of a ram support seat on the front end of a stationary arm fixed to the body of the gun in conjunction with a rivet ram on the front end of a forward and backward movable forcing rod to facilitate riveting. An electric motor is installed in the body of the gun. The output shaft of the electric motor is connected through a coupling to a drive shaft. A rotating screw plate that cannot move backward and forward has threads meshing with the threads provided on the circumference of the forcing rod. A speed reduction means is provided between said drive shaft and rotating screw plate.

[Figure]

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## **Claims**

1.     **Portable rivet gun, using a ram support seat on the front end of a stationary arm fixed to the body of the gun in conjunction with a rivet ram on the front end of a forward and backward movable forcing rod to carry out riveting, characterized in that an electric motor is installed in the body of the gun, the output shaft of the electric motor being connected through a coupling to a drive shaft and there being mounted on said gun body a rotating screw plate such that it can move neither forward nor backward, the rotating screw plate having threads that mesh with the threads that are provided on the circumference of the forcing rod and a speed reduction means being provided between said drive shaft and rotating screw plate.**

## **Description**

### **P rtable Rivet Gun**

The present invention relates to a type of rivet gun. In particular, it concerns a portable rivet gun that uses a ram support seat on the front end of a stationary arm fixed to the body of the gun and a rivet ram on the front end of a forward and backward movable forcing rod to facilitate riveting.

Rivet guns that use electric motors have been known in the art, e.g. as disclosed in Japanese Patent Gazette Publication No. (1988) 199086 or new Utility Model Publication No. (1992) 471. However, this type of portable rivet gun, like the one disclosed in Patent Gazette Publication No. (1982) 102772, uses a hydraulic cylinder or air cylinder to drive the forcing rod.

In the current art of portable rivet guns, the guns generally use a hydraulic cylinder or air cylinder, and thus they have the following problems:

- (1) In addition to requiring an electrical power supply for motive power, they require oil and air, thus limiting the places where they can be used.
- (2) Because they require a totally sealed structure to overcome oil leakage and air leakage, rivet guns are high-priced.
- (3) It is difficult to adjust speed while riveting. Thus, the material that is being worked often is damaged.

The aim of the present invention is to solve the aforementioned problems with the existing technology. The object is to provide a portable rivet gun which (because it has an electric motor) can be used in a wider range of places, does not need a totally sealed structure, allows for convenient speed adjustment while riveting, and has a low manufacturing cost.

In order to achieve the aforementioned objects, the portable rivet gun of the present invention makes use of a ram support seat on the front end of a stationary arm fixed to the body of the gun in conjunction with a rivet ram on the front end of a forward and backward movable forcing rod to facilitate riveting. It is characterized by the fact that an electric motor is installed in the body of the gun. The output shaft of the electric motor is connected through a coupling to a drive shaft. A rotating screw plate is mounted on said gun body in such a manner that it cannot move forward and backward. The rotating screw plate has threads that mesh with the threads that are provided on the circumference of the forcing rod. A speed reduction means is provided between said drive shaft and rotating screw plate.

When the structural piece to be riveted is placed to one side of the ram support seat and the electric motor is powered, the rotation of the electric motor output shaft is first slowed by the drive shaft and then causes the rotating screw plate to rotate. The rotation of said rotating screw plate causes the forcing rod to advance and push up against the structural piece to be riveted. The riveting operation is completed by causing the forcing rod to advance a step further and then effecting a combined operation of the ram and the ram support seat.

The only motive power used for driving the electric motor is electricity. Thus, there is no need for a sealed structure since no hydraulic cylinder or air cylinder is used. Moreover, one can easily adjust the speed of the movement of the forcing rod by controlling the rotation of the electric motor.

The following attached drawings provide a detailed description of the present invention.

FIG. 1 is a cross-sectional partial side view of the portable rivet gun of the present invention.

FIG. 2 is a cross-sectional view of the riveting part of the portable rivet gun of the present invention.

FIG. 3 is a cross-sectional view at completion of riveting.

An explanation of an embodiment of the present invention now follows, with reference to FIGS. 1 through 3.

In the figures, 1 is the rivet gun body. Mounted on said body 1 are an electric motor 2, a stationary arm 3, and a backward and forward movable forcing rod 4.

Mounted on the front end of output shaft 5 of electric motor 2 is a coupling 6. A drive shaft 7 is connected to the other side of coupling 6. In addition, rivet ram 8 is firmly secured to the front end of forcing rod 4. Screw threads 9 are on the circumference of the middle portion of forcing rod 4. 10 is a rotating screw plate which fits around the outer edge of forcing rod 4 and which, relative to gun body 1, is mounted such that it cannot move back and forth. Said rotating screw plate is internally provided with screw threads 11 that can mesh with screw

threads 9. Speed reduction means 12, of gear assembly construction, is provided between said rotating screw plate 10 and drive shaft 7. In addition, ram support seat 14 is mounted on the front end of stationary arm 3 at a position opposite to rivet ram 8. Ram support seat 14 has recess 13 used by the ram support seat.

In addition, at a position on the outside of rivet ram 8, limiting piece 17 is internally provided with bushing 16. Bushing 16 is acted upon by spring 15 and is pushed forward until it rests against the end. At a position on the outside of ram support seat 14, limiting piece 20 is also internally provided with forward-pushed bushing 19 that is acted upon by spring 18 until it rests against the end.

When the portable rivet gun constructed from the aforementioned components changes from the state shown in FIG.1 to the state shown in FIG. 2, the structural pieces, A and B, that are to be riveted combine and rest against recess 13 of ram support seat 14, causing output shaft 5 of electric motor 2 to rotate. The rotation of output shaft 5 is transmitted through coupling 6 to drive shaft 7, and its speed is reduced as it passes through speed reduction means 12, which is constructed from a gear assembly, causing rotating screw plate 10 to rotate on the outside of forcing rod 4. Because threads 11 on the inner circumference of rotating screw plate 10 and threads 9 on the outer circumference of forcing rod 4 mutually engage, and because rotating screw plate 10 is mounted such that it cannot move forward and backward relative gun body 1, the rotation of rotating screw plate 10 causes forcing rod 4 to advance.

When the forward movement of forcing rod 4 causes the front end of rivet ram 8 and bushing 16 to connect with one side of structural pieces A and B, adjustment of the rotation speed of electric motor 2 causes them to reduce speed. By increasing torque, the motion of forcing rod 4 changes such that it slowly advances with great pressure. At this time, bushing 16, lying snugly against one side of structural pieces A and B that are to be riveted, overcomes the resilience of spring 15 and is pressed into limiting piece 17. Therefore, only the rivet ram advances. And on one side of ram support seat 14, with bushing 19 connected to the other side of structural pieces A and B that are to be riveted, the resilience of spring 18 is overcome, and it, likewise, is pressed into limiting piece 20, therefore causing the front surface of bushing 19 and the front surface of ram support seat 14 to be on the same plane. Then, rivet ram 8 continues to advance, subjecting structural pieces A and B to greater pressure where they connect to one side of ram 8. The side opposite to the part that is under pressure is pressed into the recess of ram support seat 14, thereby causing structural pieces A and B to be riveted, as shown in FIG. 3.

When the aforementioned riveting ends, forcing rod 4 is quickly withdrawn by means of reversing the rotation of electric motor 2 and by quickly rotating. Rivet ram 8 and structural pieces A and B are thereby caused to separate. The action of spring 15 advances bushing 16, thereby causing ram 8 to retract into bushing 16. At the same time, because spring 18 is pushing against bushing 19 on the side of ram support seat 14, the riveted parts of structural pieces A and B easily withdraw from the recess.

Because the portable rivet gun of the present invention makes use of an electric motor to control the forward and backward movement of the forcing rod, the only motive power source for driving the electric motor is electricity, which allows for use in a wider range of places. In addition, the portable rivet gun of the present invention does not use a hydraulic cylinder or an air cylinder, and it thus does not require a special seal structure. And because the speed at which the forcing rod moves can be changed by controlling the rotation of the electric motor, it can be easily adjusted. Moreover, less damage is done to the rivet structural pieces because the appropriate rivet pressure can be easily attained. Thus, the rivet gun of the present invention has the characteristics of low price and superior performance.

Drawings Attached to Description